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## Claims

- 1. A method for the protection of a poikilothermic fish against infection by the bacterial pathogen *Piscirickettsia salmonis* comprised of administering either intraperitoneally, by immersion, or orally or by any combination of routes to said animal an immunogenic amount of a pharmaceutical composition comprising a principal antigen, the OspA lipoprotein, its variants, its non-lipidated form, or antigenic peptides derived or synthesized thereof, with or without an adjuvant.
- 2. A method as in claim 1 where the OspA antigen or a variants thereof are fused to at least one other protein or protein fragment either at the N or C terminus or both where that protein may be either used to facilitate expression and/or the formation of insoluble intracellular aggregates (inclusion bodies), soluble intracellular, extracellular, or periplasmic protein.
- 3. A method as in claim 1 where the OspA antigen or a variants thereof are fused to other proteins or protein fragments where those proteins or protein fragments are lymphocyte T and/or B cell epitopes.
- 4. A method as in claim 3 whereby all vaccine antigens against any bacterial, viral and/or parasitic diseases of fin fish has been fused to other protein or protein fragments where those proteins or protein fragments are any lymphocyte T and/or B cell epitopes.
- 5. A method as in claim 3, where the said vaccine or variants thereof are encapsulated in or adsorbed to or are in the form of an insoluble polymeric matrix.
- 6. A method as in claim 5, where the principle OspA antigen, its variants, fragments, fusion proteins, or synthetic peptides thereof comprise sequence homologues of the OspA protein.
- 7. A method as in claim 6 where the vaccine antigen is formulated with or without an adjuvant.
- 8. A method as in claim 7 whereby any recombinant vaccine antigen, its variants or fusion protein constructs thereof are used as a vaccine, with or without other related or non-related vaccine immunogens or adjuvants singly or in combination, against any fin-fish disease caused by either a virus, bacteria or parasite.
- 9. A method as in claim 6 where the route of administration is of either a protein, lipoprotein or DNA vaccine version singly or in combination is administered either orally, intraperitoneally, intramuscularly, intradermally or by immersion or spraying or by any combination of these methods.

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- 10. A method as in claim 6, where DNA of a sequence corresponding to that of ospA, fragments or synthetic oligonucleotides thereof or of DNA sequence homologues of ospA, fragments or synthetic oligonucleotides derived thereof are used as a vaccine.
- 11. A method as in claim 3, where the principle antigen is either that corresponding to OspA or a OspA homologue where the sequence has been optimized for expression in a suitable expression host microorganism such as an *E. coli* bacterial strain.
- 12. A method as in claim 3 where the expression of the OspA protein, its variants, lipoprotein version or antigenic peptides derived or synthesized thereof in *E. coli* is effected by a promoter.
- 13. An immunological method for the detection of humoral antibody to protein OspA or to *P. salmonis* in sera of poikilothermic fishes where either the OspA protein, a fragment or synthesized peptide thereof or OspA and its fusion partner are used to adsorb or bind to fish immunoglobulin from fish sera.
- 14. A method whereby any prokaryotic or eukaryotic expression systems are used to express the OspA protein, its variants, a fragment or synthesized peptide thereof, a fusion partner-OspA protein thereof or where OspA proteins or protein fragments are expressed with T and/or B cell epitopes.
- 15. An isolated nucleic acid fragment encoding a 17 kDa protein, wherein said protein is immunoreactive with anti- *P. salmonis* serum, and wherein said protein has an amino acid sequence of SEQ ID NO: 2 encompassing amino acid substitutions, additions and deletions that do not alter the function of said protein.
- 16. The nucleic acid fragment of claim 15, comprising a configuous sequence of SEQ ID NOs:3 & 5 or the full length complement thereof.
- 17. The nucleic acid fragment of claim 15 operatively linked to a promoter.
- 18. The nucleic acid fragment of claim 17 wherein the promoter is a recombinant promoter.
- 19. A vaccine comprising a contiguous nucleic acid sequence of SEQ ID NOs: 1, 3 & 5.

- 20. A vector comprising a contiguous nucleic acid sequence of SEQ ID NOs: 1, 3 & 5.
- 21. The vector of claim 20, wherein the vector is an expression vector capable of expressing a peptide encoded by SEQ NOs:1, 3 & 5...
- 22. A host cell comprising the nucleic acid fragment of SEQ ID NOs:1, 3 & 5.
- 23. A method for producing a recombinant 17 kDa antigen of *P. salmonis* comprising the steps as outlined in Examples 4 & 5.
- 24. A method for determining previous sensitization of a subject with the OspA polypeptide of *P. salmonis* comprising the steps as outlined in Example 6.
- 25. Use of the OspA polypeptide or DNA encoding the gene for OspA as well as those DNA regions flanking that gene of *P. salmonis* in the manufacture of a diagnostic agent.
- 26. The method of incorporation of highly immunogenic promiscuous TCE's into one or more chimeric fusion proteins in fish.
- 27. The method as defined in claim \$6, wherein the fish is a selected salmonid.
- 28. The method of incorporation of highly immunogenic promiscuous TCE's into OspA fusion protein to elicit immunostimulatory effects in the immune system of fish.
- 29. The method as defined in claim 28, wherein the fish is a selected salmonid.
- 30. The method as defined in claims 28, implemented by a vaccine.
- 31. A vaccine for eliciting immunostimulatory effects in the immune system of fish comprising selected highly immunogenic promiscuous TCE's incorporated into one or more chimeric fusion proteins.
- 32. A vaccine as defined in claim 31, wherein the chimeric fusion protein is OspA.

